the White-Tailed Deer in Ontario

its ecology and management

by H. L. Smith
and P. L. Verkruysse

Wildlife Branch—1983

Ontario
Ministry of Natural Resources

Hon. Alan W. Pope
Minister

W. T. Foster
Deputy Minister

the White-Tailed Deer in Ontario

its ecology and management

by H. L. Smith
and P. L. Verkruysse

Wildlife Branch—1983

Ontario

Ministry of Natural Resources

Hon. Alan W. Pope
Minister

W. T. Foster
Deputy Minister

Introduction

"Look! A deer!"

Few of us fail to show enthusiasm when we come upon one of these elusive animals. Camping, hiking, exploring the woodland or hunting, we watch for the shake of an antlered head or the flip of a white tail. When we see it, we may feel pleasure, challenge, or—particularly in a time of increasing threats to nature—a sense of reassurance.

For many people, the deer has sentimental value, conjuring up pleasing but unrealistic pictures of a natural world that is noble, innocent and gentle. Our society also uses the deer as a symbol of qualities we value in ourselves. This tendency to look for human traits in nature has produced such popular images as that of the soft-eyed doe tenderly caring for her newborn fawn, or that of the brave buck defiantly at bay. These images have more to do with us than with deer, but they are the products of long tradition and tell us something about the deer's cultural importance.

Part of this tradition is European in origin and was imported with the first settlers, but much of it developed here. Ontario's Iroquoian and Algonkian tribes valued the deer for meat, clothing and tools. Like many hunted animals, the deer became the subject of myth and the centre of ceremony. Courtships, weddings and funerals were accompanied by offerings of deer skins, and some Huron and Iroquois clans and tribes took their names from their own words for the animal.

With the coming of settlers, dense forests were opened up by logging and cleared for agriculture. The kind of woodland openings and forest edges that offer the right conditions for deer were created. The herds began to increase and move northward, following the path of land development. Gradually, deer came to occupy regions more northerly than any they had formerly inhabited. People began to take their abundance for granted, and a hunting tradition was established where previously there had been few deer to hunt.

Today, deer hunting is the focus of one of the province's important recreational industries. So popular is the sport that, in 1980, for example, Ontario residents and visiting hunters spent more than $16 million on goods and services associated with it.

Whether we value deer for the economic benefits they provide, for the pleasure they give those who see them, or for their cultural and historical significance, what is important is that Ontario's herds are managed well. Management includes the careful control of hunting, which can help maintain the necessary balance between the size of individual herds and the amount of food and shelter available to them. Food, shelter and water are components of what is known as the deer's *habitat*, and the number of deer the habitat can support is called *carrying capacity*. Deer management also includes the conservation or creation of valuable habitat like forest openings and woodland edges, as well as the provision of additional food sources to increase the habitat's carrying capacity.

The need for good deer management is becoming increasingly apparent. The conditions that affect the number of deer in Ontario have changed greatly in recent years, and herds in some areas have suffered serious declines. However, the approaches to manage-

ment described in this booklet should ensure that future generations can enjoy the benefits of healthy deer populations.

Name and Family

The scientific name of the white-tailed deer is *Odocoileus virginianus*, which might be roughly translated, "cusp-toothed Virginian."

The whitetail belongs to the family known as "Cervidae." This word refers to the solid antlers grown and shed each year by the males of each species in the family. The moose, the woodland caribou, the elk or wapiti, and the mule deer are also Cervidae species.

The whitetail, the moose and the woodland caribou are all long-time residents of Ontario. Moose are found mainly in our northern regions, and caribou live chiefly around the Hudson Bay Lowland and in scattered areas of the north. Elk, once common in southern Ontario, became extinct here by about 1850. The species was reintroduced in the early 1930s, but only a few elk can now be found here. Like mule deer, elk are usually seen in western Canada.

Occurrence

White-tailed deer are distributed over a large part of North America. The total area they inhabit is called their *continental range*. It extends from Nova Scotia in the east to the Rocky Mountains in the west, and from about latitude 49° in the north to the Gulf of Mexico in the south. In Ontario, deer live at the northern limit of their continental range.

Ontario's important deer populations fall within three geographic areas shown on the map inside the back cover of this booklet.

The first area, the southern agricultural zone, is essentially that part of Ontario south of the Canadian Shield. It is composed mainly of fertile croplands intermixed with small woodlots and forested stream valleys.

North of this is the central zone, which takes in part of the Canadian Shield as far north as the boundary shown on the map. The landscape of the central zone is generally hilly, irregular and rough, and has extensive areas of exposed bedrock. Most of the land is unsuitable for agriculture, and vegetation consists mainly of hardwoods like sugar maple and various oaks, and conifers like white pine and hemlock.

The northwestern zone extends westward from the Nipigon River. In its northern section, the landscape is rough and typical of the Shield. To the south, it is flatter and better suited to farming.

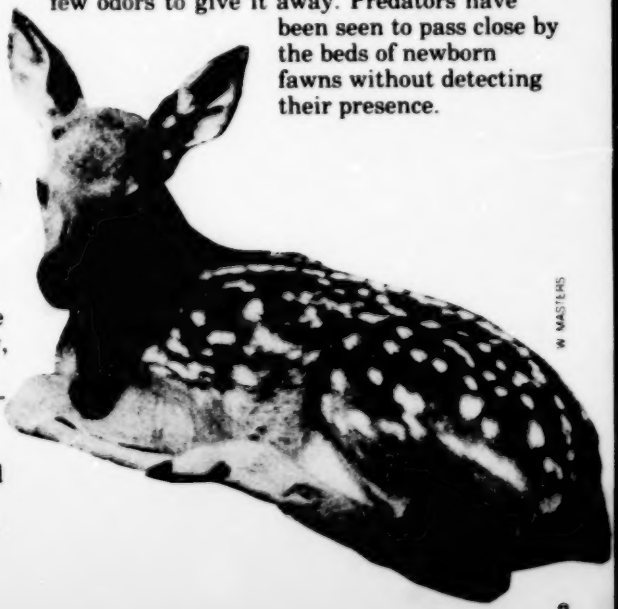
Only a few strays or isolated small groups are now found north of these major zones.

Description

One of the oldest Cervidae species, the whitetail is descended from antlered deer that appeared during the Miocene epoch, some 12 to 25 million years ago. The deer withstood the onslaughts of the Ice Age, which wiped out whole families of animals. It resisted extinction as predators ranging from the sabre-toothed cat to the wolf took their toll, and in spite of the heavy reliance of early native peoples on its meat, hide, antlers and bones. It survived because it was adaptable, and to describe the whitetail as it is today is to talk mainly of its adaptations.

One adaptation is the seasonal change that occurs in the color and texture of the deer's coat. The summer coat is similar in color to red fox fur and has short, stiff, wiry hairs. This coat is replaced in early fall by one of grey, composed of longer, thicker hairs with a high insulating value. An underlayer of downy hairs adds extra warmth in winter.

The adaptation process has given the fawn a reddish coat dappled with light spots about five centimetres across. This natural camouflage mimics the light-and-dark pattern of vegetation around the bed of the newborn. The fawn is also protected by its ability to lie very still for long periods, and it has comparatively few odors to give it away. Predators have been seen to pass close by the beds of newborn fawns without detecting their presence.



The deer has few means of defending itself when forced to make a stand, but it will rear up on its hind legs and strike severe blows with its forelegs. Whenever it can, however, the deer will run or hide from danger. It is adapted for speed and has considerable cunning. It can travel up to 48 kilometres per hour when not hindered by snow; it can jump obstacles three metres high; and it can move noiselessly through the forest, often doubling back and leaving pursuers baffled.

The whitetail's success in avoiding danger is also due to keen senses. Hearing and the sense of smell are highly developed, and vision is specially adapted for perceiving movement. The deer may overlook a motionless object in its path as it scans a forest opening, but the flick of a branch or the wave of a hand is likely to send it bounding into the bush.

Even the digestive system is well adapted for life spent constantly on the alert for predators. The deer, like the domestic cow, is a ruminant. It has a four-chambered stomach and chews its cud, or regurgitated food. Within a short period of browsing where food is plentiful, the deer can fill its first stomach, or rumen. Then it retires to a secluded spot where it can chew what it has eaten without exposing itself to danger.

Cautious and alert, the deer has keen senses. It will signal the herd with a flash of its tail if danger is near.

The solid, bony antlers that the buck grows and sheds each year should not be confused with the horns of cattle, which are permanent. The buck uses his antlers to establish dominance over other bucks during the mating season, or rut. Antlers are an adaptation related to the social life of the herd, helping to determine each buck's status in relation to the others. Every year, hunters report a few does with malformed antlers. This rare abnormality is caused by a high level of male hormones.

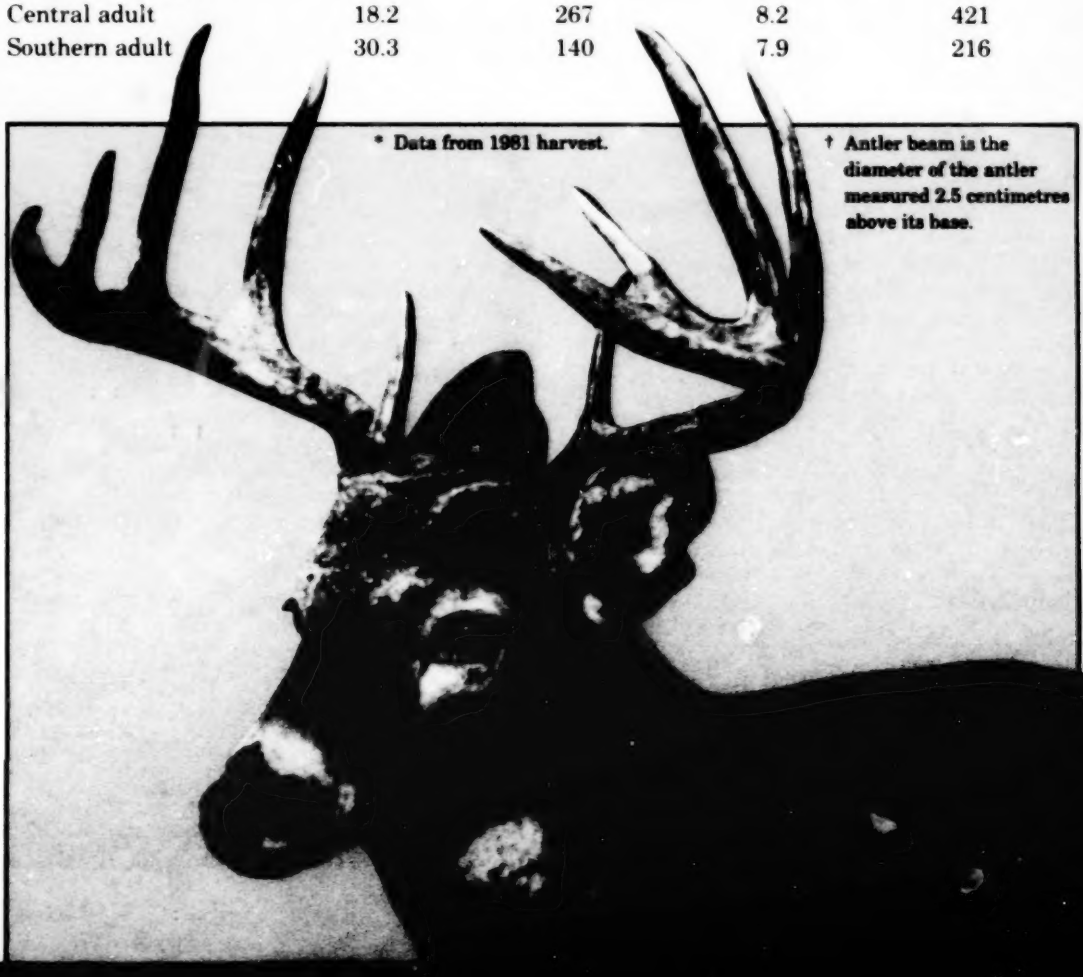
Antler size is determined chiefly by the quality and quantity of food. Heredity also plays a major part—the male offspring of bucks with large antlers tend to have the potential for large antlers. Contrary to popular belief, the number of points on a buck's rack is not a reliable indicator of age. A one-year-old, called a *yearling*, that lives where food is poor might have only small spikes. But where better food is found, a yearling might have large antlers with up to eight points. In good habitat, a buck that is four or five years old would have massive antlers with up to 14 points. After bucks pass their prime, or about age five, their antlers become smaller. Table 1 shows some average antler beam measurements and average number of points of adults and yearlings in the central and southern agricultural zones.

TABLE I: AVERAGE BEAM MEASUREMENTS AND NUMBER OF POINTS ON RACK, CENTRAL AND SOUTHERN AGRICULTURAL ZONES*

Zone/Age	Average Beam† (mm)	No. Sampled	Average No. of Points	No. Sampled
Central yearling	20.1	281	4.9	488
Southern yearling	21.6	173	5.3	238
Central adult	18.2	267	8.2	421
Southern adult	30.3	140	7.9	216

* Data from 1981 harvest.

† Antler beam is the diameter of the antler measured 2.5 centimetres above its base.



Deer of both sexes have several scent glands that function more actively during the rut. These include metatarsal glands, found on the outside of the lower hind legs, and tarsal glands, marked by white or brown-stained tufts on the inside of the hind legs. The tarsals produce a musky odor. A third gland type, found on each hoof, marks the ground where the deer walks. All of these scent glands allow deer to communicate with each other.

Many people think deer are more or less uniform in size except for the usual difference between buck and doe. But there is actually a good deal of variation from place to place. The shoulder height of the buck might range from 80 to 120 centimetres, and that of the doe, from 70 to 100 centimetres. An average buck might measure about 200 centimetres from the tip of the nose to the tip of the tail, and an average doe might be about 180 centimetres long.

Habitat and the number of deer making use of it have an important influence on body size, and particularly on weight. A buck living in good habitat with plenty of nutritious food might weigh between 100 and 130 kilograms live, or roughly 70 to 90 kilograms after field dressing (the removal of the internal organs, blood and external reproductive organs). A doe living in equally good habitat might weigh from 55 to 80 kilograms live, or roughly 40 to 55 kilograms dressed. Some exceptional bucks might reach 170 kilograms live (about 120 kilograms dressed), and some exceptional does, 115 kilograms live (about 80 kilograms dressed). Recently, the Ministry received an unofficial report of a southern Ontario buck that weighed 195 kilograms before field dressing. Table II shows some weight averages of deer in the central and southern agricultural zones.

In poor habitat, or where the competition for food is extreme, deer of both sexes weigh much less. Ontario's Navy Island in the Niagara River provides a good example of how excessive competition for food and other social stresses affect weight. Early in the 1981 hunting season, it was found that the fawns and yearlings being harvested on a nearby part of the mainland weighed almost twice as much as the fawns and yearlings being taken on Navy Island. Similarly, adults taken on the mainland were almost half again as heavy as those from Navy Island.

Climate also affects size. Animals that live in colder, northern climates tend to adapt by becoming larger than their southern relatives because more body heat can be conserved when the ratio of surface area to body volume is reduced. In other words, the larger the animal is, the less its proportionate loss of body heat when temperatures drop. Ontario's deer are among the biggest in North America.

Life Cycle

A fawn is born about 200 days after the doe is bred. If breeding occurs in mid-November, birth will take place about the end of May. An average newborn weighs between 1.4 and 2.3 kilograms, but birth weight depends on how well nourished the doe is while pregnant and whether she bears more than one fawn at a time.

For the first few days of life, the fawn depends solely on its mother's rich milk. It continues to nurse for about three months as it learns to follow the doe and adds new foods to its diet. Some fawns drink water and nibble greenery when they are 10 days old. But, like other ruminants, the deer cannot digest vegetation without certain stomach bacteria. It lacks these at birth and must obtain them from its mother, or from vegetation, soil and other materials in which they grow.

TABLE II: AVERAGE DRESSED WEIGHTS OF DEER IN CENTRAL AND SOUTHERN AGRICULTURAL ZONES, 1981.

Age/Sex Category	Central Deer (kg)	No. Sampled	Southern Deer (kg)	No. Sampled
Male fawns	33	81	32	124
Female fawns	29	56	29	102
Male yearlings	58	177	60	155
Female yearlings	48	53	48	81
Male adults	84	152	82	80
Female adults	57	78	54	73

Although a fawn can walk shortly after birth, its mother conceals it in a dry spot sheltered by grasses or shrubs whenever she leaves its side. Except when nursing, she tends to stay a short distance off to avoid attracting attention to its hiding place. This can lead people to assume that a fawn has been abandoned and to take it home—a serious mistake, for "rescued" fawns usually die.

The fawn gains weight steadily and, if harvested in fall, can weigh as much as 40 kilograms after field dressing. A large, healthy female may be ready to breed by her first fall, but a male rarely breeds before about 18 months of age. If a female fawn or a yearling doe becomes pregnant, she will probably bear only a single fawn. By the time she is three years old, she will be able to bear twins or even triplets.

Whether a yearling doe becomes pregnant, like the overall breeding success of the herd, depends on several things. The size of the existing herd has an influence; where a herd has reached or exceeded the carrying capacity of its habitat, social factors may determine which members reproduce. Summer and winter habitat conditions are also important, and the availability of shelter where winters are severe plays a significant role. Extreme cold and deep snow can reduce the number of births by putting too much stress on pregnant does.

Because deer require reserves of body fat to survive the winter, good nutrition during the rest of the year is essential to their health and breeding success. In spring, it allows deer to recover their own strength and females to produce robust fawns. In late spring and summer, good nutrition sustains nursing does and their fawns, and promotes the development of the antlers that will help determine the bucks' breeding success. And in late summer and fall, it allows deer to build up stores of body fat for the rut and the coming winter.

Alone—but not for long. This well-camouflaged fawn will lie quite still until its mother returns.

H. K. CAMPBELL

Where food is plentiful and nutritious and other conditions are favorable, as many as 30 per cent of female fawns may become pregnant in their first fall and bear young in spring. The average reproductive rate of a herd in poor habitat may be less than one fawn per doe. But in better habitat, the rate might be as high as two fawns per doe.

The buck's antlers begin to bud in early spring. They continue to grow over the summer as his level of testosterone, a male hormone, increases. The growing antlers are covered with tender skin called *velvet*, which is well supplied with nourishing blood vessels. Sensitive and easily damaged at this stage, the antlers may be deformed if the buck injures them.

By September the antlers are full-grown and hard, and the buck removes the velvet and polishes them by rubbing them against trees. Increased hormonal levels make him aggressive and ready to challenge other bucks. Various activities proclaim his heightened sense of territory. He continues to rub trees, leaving marks that hunters learn to spot. He paws bare patches in the ground and urinates in them so his scent will warn off intruders. He rattles shrubs and bushes with his antlers in a noisy display of strength. And he engages in bouts of shadow fighting with saplings and branches.

Although the doe can come into heat (become ready to mate) as early as the beginning of October, the rut normally occurs during the second and third weeks of November. The doe remains in heat for 24 hours or less, and if not bred will come into heat again four weeks later. During the rut, the buck strives to dominate his fellows through a series of threatening gestures. Occasionally, fierce fights take place. Because the buck expends a lot of energy during the rut, he may have difficulty surviving a harsh winter if food is scarce. This is especially true if the rut is prolonged. After the rut, the buck's testosterone levels drop. His antlers usually fall off by December. They are seldom found by people because mice and other rodents eat them for their calcium.

Most whitetails live to about six years of age in the wild, and are in their prime between three and six. Some deer reach eight or 10, and a few exceptional ones of 15 and 16 have been documented. In captivity, whitetailed deer can live as long as 20 years.

A buck "in velvet"—one of nature's most beautiful sights.

Habits

Whitetails eat a wide variety of plant foods, depending on the time of year and what their habitat provides.

After the winter, deer need protein. This builds muscle and other tissues and is particularly important to pregnant does. With few other foods available, deer rely mainly on the protein-rich grasses and plants that appear in woodland openings after the snow melts. Spring may also find some deer around the shores of ponds and marshes, where they can nibble tender grasses and sedges. It is at this time that deer do most of their grazing, unlike such ruminants as cattle, sheep and elk, which graze year-round. As spring progresses, new leaves provide another source of protein. Aspen leaves are especially protein-rich.

In summer, energy-producing carbohydrates are a primary requirement. The leaves and tips of aspen, cherry, elm, oak, maple, willow, bearberry, elder, hazel, honeysuckle and juneberry are primary food sources. A favorite deer snack is the yellow birch seedling, but once it reaches the sapling stage it is ignored. The summer diet is rounded out with plenty of leafy plants and, for those deer living in agricultural habitat, with field crops.

In late summer and throughout the fall, deer eat the ripening fruit of many trees and shrubs. This sometimes causes problems for orchard owners. The main dietary requirement at this time is fat, which allows deer to build up reserves for winter. Mushrooms are a favorite meal, as are acorns, beechnuts, and other plant products that make up a food group called *mast*. Deer that have eaten

Fungi and acorn mast help deer build up fat reserves for the winter.

A deer's fall banquet—this apple tree has been cut to promote new growth at an accessible height.

plenty of mast are in peak condition for the harsh season ahead.

Winter is a critical time for deer, and they may starve if food becomes scarce. To survive, they rely mainly on a food group called *browse*, which consist of the tips, twigs and branches of certain trees and shrubs. Browse is a dietary component at other times of year, but in winter it may be the only food available. Most of the nourishment browse offers is found in the bark and in the underlying layer called *cambium*. Poplar, red cherry, dogwood, sumac, basswood, oak and cedar, along with the red, striped, mountain and sugar maples, are the main browse plants. The needles of hemlock and yew are frequently eaten. Balsam and pine may be browsed if other food is absent, but their value to deer is thought to be limited. Southern deer often dig through snow to find dried grass or nutrient-rich dead leaves. Some northern deer turn to a diet of lichens.

The food they eat and their need for protective cover influence the deer's choice of habitat. Because they do not like to leave cover, deer are not normally found in large, open fields. Usually, they remain near the edges between fields and woodlands when grazing. Neither do they live in deep, dense forests, for browse is unavailable there. It is open woodlands and forest edges that supply both cover and the shrubs, small trees and leafy plants on which deer feed.

Their eating habits and location affect the daily activity pattern of deer. Those that live where they might encounter people tend to forage from early evening until dusk, and in the early morning. Where they are less likely to be disturbed, deer will feed even at midday. They do not share our daily pattern of extended activity followed by a long sleep. Instead, they are active for a while and then take a short rest, repeating this cycle throughout the day and night.

During spring, summer and early fall,

Well-browsed twigs (left) show that a yard is heavily used. Managers have placed a measuring stick here to read snow depth.

whitetails usually remain solitary or in small groups. Where there is comparatively little snow, as in much of the southern agricultural zone, they may remain in small groups even in winter. But in the northwestern and central zones, the coming of cold weather and the dwindling of food supplies cause deer to engage in an activity called *yarding*. This means that they concentrate within specific areas where they can find food and shelter. Evergreen branches that form broad canopies and hold snow off the ground supply deer with insulated resting spots, and the best yards have plenty of these.

Yarding offers other advantages. Deer founder in deep snow and penetrate thin crusts with their sharp hooves. This makes it difficult to seek out food and run from predators, whose paws are better suited to moving on thin crusts. The well-packed trails made by the collective movements of the deer in their yards help them to reach food and escape wolves or dogs. But these trails also have disadvantages. They can make it easier for predators to give chase; and deer are usually reluctant to leave their well-used trails in search of fresh browse in nearby areas, even when starving.

Deer in the central zone tend to yard on a much larger scale than northwestern deer. The reasons for this are not fully understood, but evergreen distribution and snow conditions may be contributing causes. Unlike the conifers of the central zone, those of the northwest tend to exist in widely scattered pockets within large, mixed-wood forest stands. This discourages large-scale yarding. In the central zone, several thaws may occur over the winter, causing crusts to form. Unless the crusts are thick, they will not support a deer's weight, so large trail systems are essential. In the northwest, by contrast, few thaws occur and a general absence of crusts reduces the need for extensive trail networks.

Managers have improved this deer yard by providing piles of cut browse. Conifer shelter is nearby.

These tracks tell the story. The predator stays on top of the snow, the deer sinks.

The History of Ontario's Herds

It was mainly because people disturbed the forests that deer were able to extend their range northward in Ontario and flourish for a time. Prior to settlement by Europeans, deer lived mainly along the north shore of Lake Ontario and the St. Lawrence River, and on the north shore of Lake Erie. They occupied the forest openings and woodland edges created by fires, by beaver activity, and most of all by the Iroquois tribes whose agricultural society was well advanced by 1600.

In 1623, deer were recorded as far north as Owen Sound near the base of the Bruce Peninsula. But there were probably few deer in Ontario's northwest or even in the southern part of what is now the central zone. The forests of the Canadian Shield were heavily timbered with white pine and dense stands of mature hardwoods like maple and birch, and the food deer need was unavailable.

Between 1784 and the mid-1800s, the non-native population of "Canada west" jumped from 10,000 to 925,000. At first, the clearings created by settlers increased the southern

Early logging practices provided good deer habitat and ready-made winter trails.

deer habitat. But by 1850, settlement had peaked and the herds had reached what was perhaps their lowest ebb in history. Southern Ontario had become too open, and market hunting and an absence of harvest restrictions had placed unbearable pressure on the deer. So bad was the decline that a commission was formed in 1890 to study its causes. But deer would not return to the south in large numbers until well into the next century.

While southern settlers were reducing deer numbers, logging, mining and railway construction were opening new deer habitat to the north. These ventures, and the fires that often accompanied them, removed much of the mature forest along the Shield. New growth—often termed *second growth*—provided plenty of accessible food for the deer as they expanded their range northward. Their winter-survival and reproductive rates were increased by the abundant hardwood treetops and other slash, or logging debris, left behind, and by the logging trails that provided ready-made travel routes in snowy terrain. Logging would continue to provide good deer habitat until the end of the 1920s, a decade in which the pulpwood market would demand the removal of quantities of spruce.

The vast tract of land between the Ottawa River and Georgian Bay, from which white pine and other trees had been taken, was identified as Ontario's major deer belt in 1886. By 1890, deer had been common around Lake Nipissing for three decades, had reached Manitoulin Island, and had begun to enter Ontario from Michigan at Sault Ste. Marie.

While logging and railway construction pushed westward, deer crossed from Minnesota into the Rainy River area. These immigrant deer of the 1890s expanded their range northward as new forest habitat was created. Like the northward movement of the central deer, that of western herds was aided by a change in climate. With the new century came milder winter temperatures and decreased annual snowfalls, and the deer prospered in their new habitats. By 1909, the northern limit of the deer range was charted as corresponding roughly to the CNR tracks running from Lake Abitibi and Cochrane in the east to Sioux Lookout, Dryden and Kenora in the west. A decade later, western deer would be reported as far north as Lake St. Joseph and Red Lake, and eastern sightings would be made around the shores of James Bay.

Hunters followed the deer north on the new railway line, often in such numbers that extra "hunters' specials" had to be scheduled. With southern deer still scarce in 1910, this was the heyday of the northern hunt camps such as prospered around Parry Sound. Still, hunting pressure did not appear to be excessive, perhaps because it was being exerted on an increasing rather than a declining population—the northwestern herds did not reach their peak of abundance until about 1930. By 1945, Ontario's herds had attained their widest distribution in history.

Since that time, there has been a gradual decline in the distribution and abundance of our major herds. The second-growth forests in which the deer of the central zone had thrived continued to mature, placing food out of reach and limiting the growth of ground plants. Across Ontario, forest fires were brought under better control, and forestry techniques and the timber market changed in ways that greatly reduced the amount of new deer habitat created. Existing habitat was lost or damaged through various activities, including cottage development and the harvesting of important winter-shelter trees. During the same period, the climate changed. The long-term warming trend that began at the turn of

the century ended in the early 1950s, and winters became colder with deeper snow. The presence of fewer deer meant that wolf predation had a greater impact. And hunting pressure, which had been rapidly growing since 1946, placed further stress on the central and northwestern herds.

In the south, deer had reoccupied their former range by about 1930, reaching peak abundance in the mid-1950s. Heavy poaching and accidents caused extreme fluctuations among some local herds, but there was little harvest pressure in the south. Most of the land was privately owned, and landowners were reluctant to open their properties to hunters. Hunting pressure remained concentrated on the herds to the north, which were already declining because of many factors. As a result, the southern herds prospered while those in the central and northwestern zones continued to decline.

In 1975, a special provincial committee of deer managers was formed to identify and deal comprehensively with the problems of Ontario's deer herds. These problems, and the management solutions found, are discussed in the following sections.

Limiting Factors

Our deer herds have not declined equally throughout the province, nor has every area suffered a decline. Even within those deer zones most subject to the conditions that cause declines, a few herds remain vigorous. The Loring herd south of Lake Nipissing in the central zone is probably the most outstanding example of a healthy population. Estimated to contain 9,000 members in 1981, this herd has given deer managers an opportunity to study the conditions that let whitetails prosper, and to lay down management principles for use elsewhere. In the southern agricultural zone, some herds have increased significantly. Nevertheless, Ontario's deer population as a whole diminished by about two-thirds between 1955 and 1980.

Some of the causes of this drastic reduction have been briefly described. The causes of decline are called *mortality factors*, or—because they combine to limit the population—*limiting factors*. Their inter-relationships are extremely complex, and it is difficult to describe the effects of one without considering the effects of other factors operating at the same time. For example, the impact of predation on a herd is influenced by other factors like the quality and quantity of food and shelter, the severity of winter weather, and snow depth and crust conditions in the wintering area. Similarly, the impact of hunting on a herd cannot be measured without reviewing the other factors that influence what is termed *productivity* (the ability of the herd to replenish its numbers).

It is also important to recognize that the seriousness of any factor varies from place to place. What is a major problem in one part of the province might be minor in another. In some parts of the central zone, for instance, hunting seems to have had a greater impact on herd size than winter starvation has. Predation by wolves, though important, may be less significant in parts of the central zone than in the northwest.

It is clear that no one limiting factor can be blamed for the deer's decline. Yet it is possible to point to some of the more significant, and to find ways of offsetting their effects and rebuilding our herds.

In general, the most significant limiting factors are deteriorating habitat or habitat loss, hunting, predation by wolves and dogs, and poaching. The changes of climate over the past few decades have also limited the deer population; although we cannot control the weather, it is possible to use management to offset some of its effects. Other limiting factors include: winter starvation, which is closely tied in with climate; accidents such as collisions with automobiles; and parasites and disease.

Habitat Deterioration or Loss

FOREST HABITAT

The Problems: Deer require habitat that offers a variety of vegetation and a mixture of open and wooded areas. They thrive in disturbed forests—those that have been altered by logging, fires or other events. These forests contain plants and deciduous and evergreen trees of various types and ages. In such forest habitat, deer can meet their year-round nutritional needs and find winter shelter.

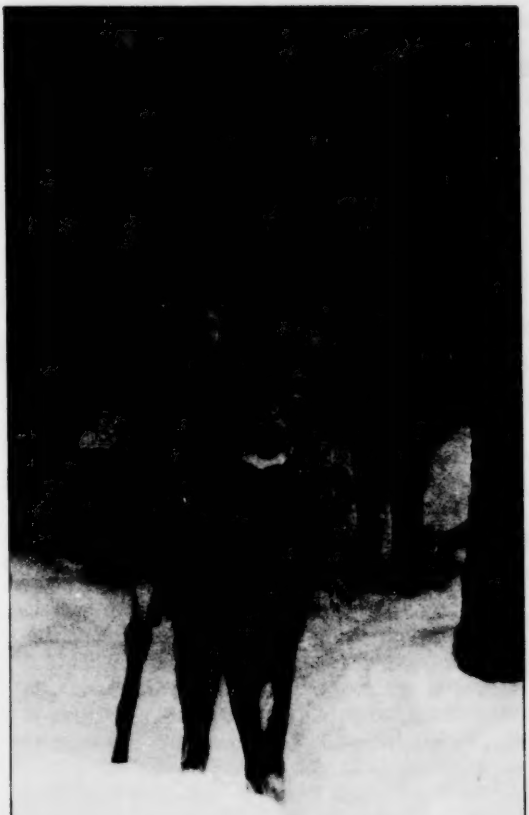
From 30 to 60 per cent of their forest habitat ideally consists of what is termed *second growth*. This is the growth that follows the removal of mature trees. Aspen, one of the first trees to appear after clearing, is often dominant. At a later stage, the slower-growing maple, birch or beech may dominate. The second-growth forest can range in age from five to 35 years, but it is important that the

trees be no more than 10 metres tall. There should be a healthy growth of shrubs and various woody and leafy plants.

Within these second-growth areas, there should be openings. In good habitat, openings make up from five to 15 per cent of the total area. The term *openings* refers to areas of two to four hectares on which there are almost no trees or bushes, but rather grasses and leafy plants. Because snow melts first in openings, they provide an early growth of greenery that helps deer rebuild their strength after the winter.

From 10 to 30 per cent of the habitat would ideally consist of mature coniferous forest for winter use. This can take the form of scattered clumps containing three or four trees each, or of extensive stands. It is important that the branches interlock or overlap to form a closed canopy. This protects deer from wind and heat loss, and holds snow off the ground to make movement easier. Food sources should be nearby so that little travelling is required. South-facing slopes that give deer a sheltered place to sun themselves improve the winter habitat.

The forest habitat of the northern herds has deteriorated over the past few decades. One problem common to both zones is the cutting of winter-shelter trees to meet an increased demand for softwoods. Northwestern deer cannot survive without evergreens, but



Deer in forest habitat need a combination of evergreen shelter (above), second-growth vegetation (below), and openings (next page).

the cutting probably has less effect on them than on the deer of the central zone. Northwestern deer yard in small groups and tend to have some freedom of movement between conifer stands during winter. But snow conditions usually confine central deer to relatively small evergreen stands within large yard complexes. These deer are left with few options when their traditional places of shelter disappear. Some important central yards have been badly damaged by the removal of slow-growing trees like hemlock.

If the winter habitat of northern deer has been damaged by too much interference, the non-winter habitat might be said to have suffered too little. Particularly in the central zone, the hardwoods that grew up after the heavy logging of the early 1900s have become too tall to furnish deer with browse. Their branches form a dense canopy that screens out sunlight and limits the growth of edible ground plants. With some exceptions, these hardwoods are now harvested selectively rather than by what is called *clear-cutting*, a practice that characterized the original logging of the Shield. Instead of removing all trees within a specific area, leaving clear-cut openings of moderate size in which second growth can begin, the forest industry now prefers to select trees for cutting from over a wide area. Only those of a certain type, age and quality are taken.

In the northwest, some clear-cutting for aspens and other trees continues on a scale that makes for good deer habitat. But in the central zone, few clear cuts beneficial to deer are now made.

The suppression of forest fires in recent years has further reduced the number of new openings and second-growth areas.

So it is that for northern deer, and particularly for those of the central zone, there is currently too little disturbance of the right kind taking place in the forests.

Management: Deteriorating habitat due to forest aging and the changes in logging methods just described is becoming a major limiting factor. But solving the problem is difficult for several reasons. Principal among them is the fact that what is best for deer may not necessarily be best for the forest industry. To clear-cut large tracts of hardwoods, many of which are too small to be of much commercial value, is usually considered uneconomical. The forest industry prefers to conserve younger trees by thinning some to let the rest mature to a marketable stage. A second impediment to clear cuts is that they are not appealing to the eye. People are often unaware of selective cutting in their localities because it is so unobtrusive. Were clear-cutting to occur, large expanses would be bare of trees. This is a prospect that many would find unacceptable—particularly if they were unaware of the benefits to deer.

To reconcile the differences among the needs of the forest industry, the public and the deer, some compromises are necessary. The best solution is to include habitat manage-

R. MUCKLESTON

ment in forest management so that the methods used to harvest and maintain timber will benefit deer while still meeting goals for forest products.

Although widespread clear-cutting is impractical, it is possible through negotiation with the forest industry to arrange for limited clear-cutting where deer would benefit most. Irregularly shaped clear cuts of 10 to 20 hectares are best, but those of up to 50 hectares are acceptable.

A second harvest alternative, the strip-shelterwood system, is a variation on clear-cutting. It removes trees in strips to allow for the regeneration that provides good habitat. In most cases, strips 40 metres wide are best, but the system can be adapted to each locality. The strip-shelterwood system calls for cutting on a more limited scale than regular clear-cutting, and can result in greater profit and a more appealing landscape.

Other harvest methods will continue to be used in spite of their failure to benefit deer. But using more suitable systems wherever possible will achieve at least some improvements to their forest habitat.

Forest-maintenance techniques can also improve deer habitat. One approach is to maintain openings. Some natural openings remain free of mature growth because of factors like poor or shallow soil. But these are not always located where they are needed, so other openings caused by fires, logging or similar agents must be kept free of new shrubs and trees. The first step is to identify all openings of less than two hectares. Those selected can then be maintained by periodic burning or mowing with heavy-duty machinery.

Other maintenance techniques are designed to improve winter habitat. One approach is to manage mature forests so that hemlock predominates. Another is to manage lowland cedar stands so they can furnish both winter shelter for deer and cedar products for commercial sale. This is done either by cutting strips 30 to 40 metres wide at right angles to the prevailing winds, or by cutting small patches within the stands. This also provides deer with food as cedar and various shrubs regenerate within the cuts. In some cases, the difficult task of planting new cedars must be undertaken.

Providing winter browse close to shelter trees also improves winter habitat. This can be done by cutting shrubs and unmarketable trees off at the ground or snow level. The cut browse provides immediate food, while the roots and stems left behind remain to sprout new growth for future winters. New browse can also be created where selective timber harvesting occurs by cutting the unmarketable trees for fuel wood. This results in small openings that allow for fresh growth. The current popularity of wood-burning stoves and furnaces may make this practice increasingly common.

In this northwestern yard, managers have cut browse trees to promote new growth and provide immediate food.

AGRICULTURAL HABITAT

The Problems: Deer that live in agricultural habitat have the same needs as deer in forested regions, but the vegetation patterns that meet these needs are different. Where there are few extensive second-growth forests, deer use woodlots, hedgerows and fencerows. Hedgerows and fencerows are farm field borders of small trees, shrubs, or fences along which vegetation has grown up. They supply food and furnish some cover for deer venturing into cultivated fields to feed on crops. Fields and field edges are a major year-round source of food for deer in farming country. Like the herds of forest habitat, southern deer use stands of evergreens for winter shelter. They often find these conifers in river valleys and ravines not far from developed areas.

The most important quality agricultural habitat can offer is variety. The best landscape for deer would include a mixture of features—woodlots, hedgerows, fencerows, fields, shrubby edges and wetlands, as well as railroad, hydro, road and pipeline right-of-ways.

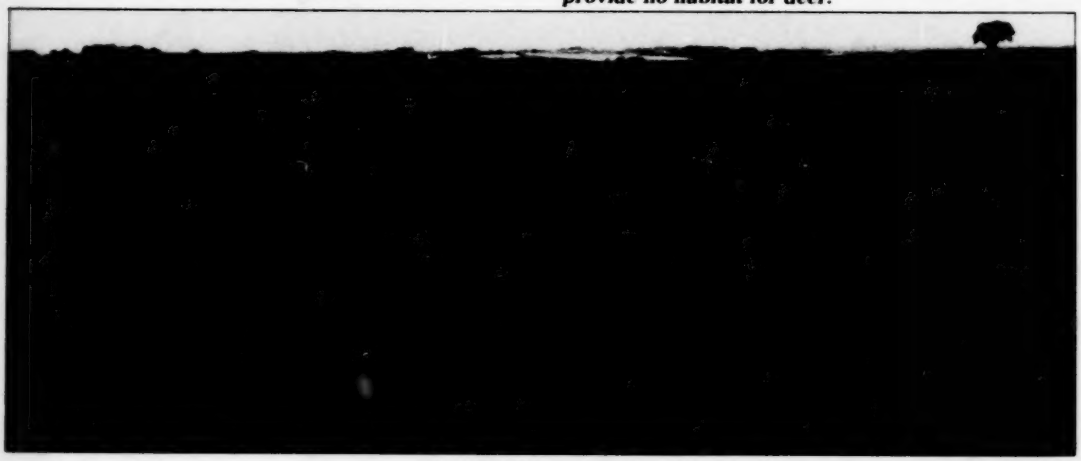
Some agricultural habitat is found in the northwestern zone, particularly in the Rainy River area near the Minnesota border. It is partly because of the farming practised there that local herds have remained fairly abundant while some other northwestern herds have all but disappeared. But the best farmland habitat is found in the southern agricultural zone, which can be divided into two sections—eastern and western.

The eastern section borders the Canadian Shield and is less fertile than the western. Its marginal farmland provides good non-winter habitat, and the uncultivated areas contain plenty of leafy plants, edge, second growth and openings. Only the deer's wintering areas, found mainly in old farm woodlots and cedar swamps, require active management. The southeastern deer manager's main problem is to determine how to encourage good management of important wintering areas located on private land.

Maintaining a place for deer in the western section is far more difficult. It has some of Canada's best farmland, and about 80 per cent of Ontario's population is concentrated there. Wildlife habitat has shrunk markedly as cities have grown and agriculture intensified. Development competes strongly with farming, and farmers have had to make the most of the land that remains. Hedgerows, fencerows, shrubby edges and wetlands have been seen as wasted space and as barriers to modern farm machinery. These features have been widely removed. Farmers who keep their woodlots often manage for mature trees that can be sold, so the woodlots are of little use to deer. Other woodlots are heavily grazed by cattle. In addition, modern farmers tend to grow one main crop on large, unbroken fields. Unlike the mixed farming of the past, this clean farming, as it is called, makes for poor habitat.

Although such adverse conditions are widespread in the southwest, some areas still offer good deer habitat. In many of these, a combination of plentiful food, adequate cover, favorable weather and lack of hunting pressure has allowed the deer to become overabundant. This frequently results in serious crop damage and a high rate of deer-vehicle collisions.

No place to hide—farming methods such as this provide no habitat for deer.



Management: The task faced by southeastern deer managers—encouraging good management of wintering areas on private land—can be tackled in various ways. For example, the land can be designated for wildlife habitat under municipal Official Plans, protected under agreements between the Ministry and individual landowners, or purchased if the need for long-term control justifies the expense. Managers can then proceed with conifer regeneration and browse production in the wintering areas.

In the southwest, the problem of shrinking deer habitat is dealt with in several ways. One approach is to effect good management of important habitat through the same methods used in the southeast. For example, as of 1978, some 120,000 hectares of Crown and private land had been secured for the production of wildlife habitat under agreements with individuals or public agencies.

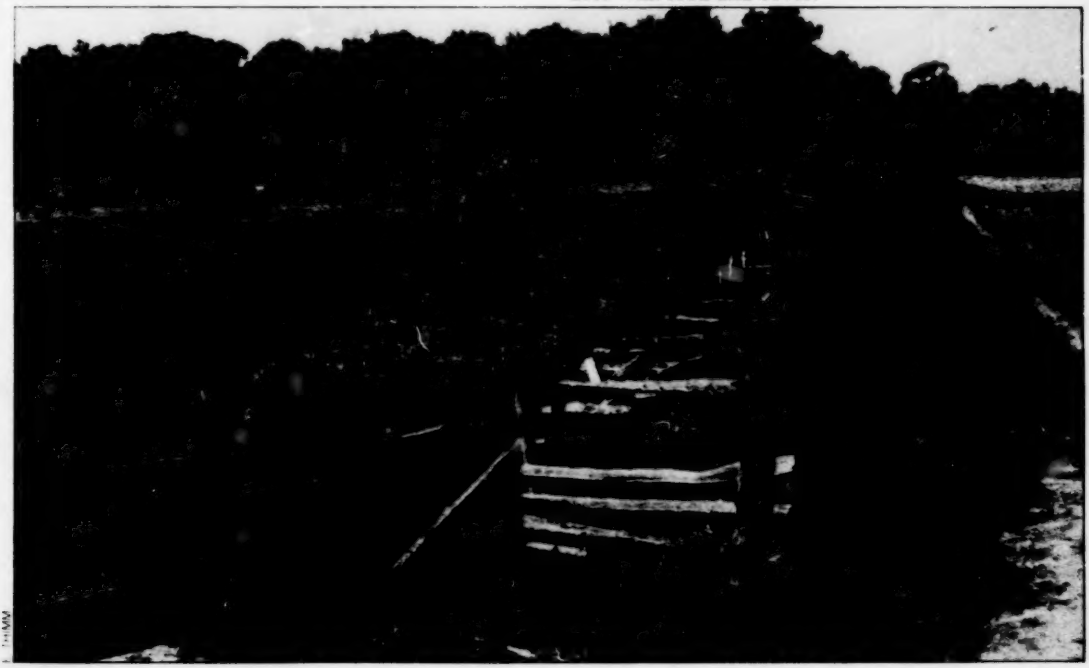
A second approach is to encourage the provision of habitat on lands not under agreement. Through its extension programs, the Ministry offers advice, information and assistance to people who want to improve the habitat on their lands. Farmers are encouraged to recognize that habitat features like hedgerows, fencerows, wetlands and woodlots not only benefit deer and other wildlife, but also improve farmland by preventing the drought and erosion that can result from clean farming. Some agricultural agencies are now advocating that these features be retained to protect soil and crops.

A third approach is to protect habitat that might be damaged through development or other land-use changes. The Ministry participates with planners and local councils in making land-use decisions, supplying information on any habitat areas that fall within the boundaries of a proposed development. Special emphasis is placed on protecting traditional wintering areas.

Through the controlled hunts introduced in 1979 (*see "Hunting"*), deer managers can focus hunting pressure on overpopulated herds causing crop damage and accidents. This system will control problem herds, reduce hunting pressure on herds hampered by poor habitat or other limiting factors until improvements can be made, and give southern residents more opportunities to hunt deer without having to go north.

Although the competition for land in the agricultural south will undoubtedly continue, these and other management techniques should ensure that the comparative abundance which has characterized our southern herds for many decades will not be sacrificed.

Fencerows, woodlots and woodlot edges furnish deer with food and cover.



Hunting

The Problems: The deer harvest has traditionally provided Ontario with considerable economic benefits and, particularly in the tourist industry, has produced many jobs. But between 1967 and 1977, the impact of the decline in deer numbers became evident: the number of sportsmen hunting each year dropped from 148,000 to 99,000, and the number of deer in the yearly harvest fell from 40,000 to 14,000. During the same time, the total economic benefits of the harvest shrank by one-third. And between 1973 and 1976, spending by non-resident hunters fell by 30 per cent; this loss was significant, for non-residents bring into the province money that would not otherwise be gained. In 1979, deer managers predicted that if Ontario continued its existing management practices—including the accepted methods of controlling the harvest—the economic benefits deer provide would be cut in half within 10 years. In addition, the province would suffer an annual loss of employment equal to a full year's work for 600 people.

Until recently, deer managers generally ascribed hunting only a small role in the reduction of our northern herds. They knew that a few herds had declined as a direct result of hunting pressure. But the general deer population was judged capable of withstanding the stress of the traditional hunt, which in most areas let sportsmen take deer of any age and either sex. Because so many factors were at work to limit the size of a herd, it was difficult to isolate the impact of this "any-deer harvest" to determine if pressure were excessive.

But as more and more information was collected, it gradually became clear that in some places and during certain years hunting had been a serious limiting factor. Its impact could be seen to increase where other factors like habitat loss, heavy predation by wolves or dogs, or harsh winters were already at work to limit herd size. The recent history of the northwestern herds illustrates this point.

With its reputation for long hunting seasons, few restrictions and high rates of hunter success, the northwest attracted sportsmen from across Ontario as well as from the United

Deer hunting provides recreation and produces many jobs.

E. BAIN

States. Although its herds were stressed by cold winters and heavy wolf predation, they seemed able to bear the existing hunting pressure. Then, in the mid-1960s, this changed. Logging companies had converted from horses to heavy machinery that was difficult to move, and this had led them to enlarge their clear cuts. Many shelter trees disappeared just as winters became more severe. In some areas, this shortage of shelter forced deer to concentrate under the remaining cover, making them more vulnerable to wolves than when they were more widely scattered. In addition, pulp cutting created many new access routes into deer areas, giving hunters a greater advantage than ever before. This combination of factors caused dramatic declines. By the late 1960s, many northern areas had found it necessary to place more restrictions on their hunts. Today, the major herds of the northwest live in Fort Frances District, and particularly in the good habitat around Rainy River.

The declines in the northwest were paralleled by declines in the central zone. But in the agricultural south, things were quite different. The return of the herds to southern Ontario created limited hunting opportunities until the 1960s. Then, between 1967 and 1977, the area within this zone in which hunting was permitted shrank by one-quarter. More land was developed, increasing numbers of people with urban backgrounds bought parcels of former farmland, and anti-trespass sentiments spread. The number of southern sportsmen travelling to the north and northwest in search of hunting opportunities grew, and greater stress was placed on those already-declining herds. Meanwhile, the deer of the south flourished.

By the late 1960s and early 1970s, the need to reduce or control hunting pressure in Ontario was becoming clear. Greater restrictions were imposed, seasons were shortened in some areas, and fewer licences were sold to out-of-province hunters. But these measures were not sufficient to permit the herds to recover from the combined effects of all limiting factors.

Management: When the deer program was re-evaluated in 1975, two major changes to the annual deer harvest were proposed.

The first change to be introduced brought what are called *controlled firearm hunts* to the southern agricultural zone in 1979. This increased local hunting opportunities and decreased hunting pressure on the northern herds. By placing strict limits on the number of firearm hunters active within each given area, these controlled hunts reassure landowners who might otherwise be reluctant to have hunters on their properties. An incentive to landowners living where crop damage and deer-vehicle collisions are common is the ability of these hunts to reduce overabundant herds.

To participate in the controlled firearm hunts of the south, each sportsman applies for a place in the hunt of his choice through the local District Office of the Ministry. If successful, he receives a controlled deer hunt validation tag.

The second change to the deer harvest was put in place in 1980. Because it was known that the removal of too many breeding females caused a herd to decline, a system called *selective harvest* allowing control of this factor was devised. Selective harvest works by limiting the number of does and fawns—called *antlerless deer*—that can be taken from each herd. All licensed hunters may shoot bucks, and, where a herd is near, at, or in excess of carrying capacity, most or all hunters may take antlerless deer. But where a herd is below

Selective harvest can protect breeding does like this one until diminished herds recover.

T. JENKINS

carrying capacity, many hunters may be restricted to bucks only.

In the central and northwestern zones, the privilege of taking antlerless deer is represented by a special tag issued by the Ministry and allotted by means of a central computerized draw. In these zones, all hunters who wish to take antlerless deer must apply for these tags after they obtain their hunting licences, and must not hunt does or fawns unless they have received validation tags. In the southern agricultural zone, by contrast, hunters do not normally need antlerless deer tags in order to take does or fawns. Their controlled deer hunt validation tags entitle them to take any deer. But should a southern herd fall below carrying capacity, selective harvest could be combined with the controlled hunt to give that herd greater protection while it rebuilds itself.

A conservation officer checks a bowhunter's equipment.

Both controlled firearm hunts and the selective harvest system allow for maximum flexibility. In the south, deer managers can make the necessary adjustments each year to the number of hunters in each area, and can impose selective harvest should a herd drop below carrying capacity. In the central and northwestern zones, the number of antlerless deer tags issued can be increased or reduced as herd size fluctuates. To help deer managers make these decisions each year, hunters are asked to inform the Ministry of their success, the sex of any deer killed, and any other pertinent information.

The goal of the current harvest system is to provide the maximum number of hunting opportunities possible while at the same time allowing underpopulated herds to rebuild themselves. The system's success was already becoming apparent during its first year of use. In 1980, selective harvest reduced the number of antlerless deer killed by an estimated 6,000. Deer managers projected that this would allow the provincial deer herd to increase by six to eight per cent.

In the Ministry's Algonquin Region, the results were even more encouraging. There, the antlerless harvest dropped from 3,600 in 1979 to 300 in 1980. Deer managers anticipated that the Region's deer population would increase by 15 per cent provided no other limiting factor were to assume a major role.

Approximately 1,000 more people hunted in 1980 than had hunted the previous year, when the selective harvest system was not yet in effect. The provincial rate of hunter success remained virtually the same over the two years. These facts illustrate that the new system, while reducing the number of breeding females taken, will not reduce the number of recreational opportunities available to hunters. On the contrary, it will create many new opportunities in southern Ontario, and will ensure future opportunities throughout the province by protecting our herds.

Together with other management techniques, today's harvest system should help to reverse the downward trend that has characterized many of our herds over the past few decades. The deer population will never reach the high levels attained when the land was pioneered. But managers expect that the 1979 harvest of 14,000 deer will increase to a sustainable harvest of 30,000 by the end of the 1980s. This increase will provide recreation for 150,000 sportsmen annually, or one-and-one-half times the number that hunted in 1978.

Predation

The Problems: In the past, most deer managers thought that the size of herds living in large, wooded areas was determined chiefly by environment and habitat. Because predators usually kill the most vulnerable deer—young fawns in early summer, and fawns and aged or malnourished deer in winter—managers believed that only that portion of the herd which would have died in any event was being lost to predation. In the case of wolves, which rely mainly on deer for food, managers believed that a pack's effect on a herd could not be too severe because this would jeopardize the pack's own survival.

Recent studies have proved these assumptions wrong. Researchers have since found wolf predation a serious limiting factor in some areas, particularly in the northwestern and central zones. Wolves have wiped out herds in certain central yards, and, in both northern deer zones, have prevented some herds from reaching carrying capacity.

Similarly, predation by dogs has inflicted serious losses on some large herds and wiped out some small herds. In the southern agricultural zone, where the problem is most serious, there were 193 confirmed fatal attacks on deer by dogs during the winter of 1981-82. Many more were suspected.

Wolves are the natural predators of deer, and there is little evidence that they kill without need or leave carcasses uneaten. In fact, they sometimes revisit old kills for another meal. Woodsmen who have reported finding wolf-killed deer untouched have probably caused the pack to flee by approaching the kill site. A study done in Parry Sound during the winters of 1968 and 1969 showed that wolves there were wasting little deer flesh. The average kill rate was slightly less than two deer per wolf per month, and predation accounted for 10 per cent of the total winter losses. The deeper the snow and the worse the crust conditions for deer, however, the greater are the chances that a wolf pack will take more deer than it needs to survive.

Wolves kill deer to survive, and leave very little behind.

Blood on the ice—this deer has died of wounds to its hind legs. Such wounds are typical of dog predation.

E. BAIN

When deer cannot run and wolves can, a small pack may have a kill rate almost as high as a larger pack's. Deep snow and thin crusts can also let wolves kill more of the large, healthy deer that might otherwise survive the winter.

The problem of wolf predation increases when other factors work against deer. Where habitat is poor, weather bad, snow deep and hunting pressure heavy, wolf predation accelerates the herd's decline. In the late 1960s, when Ontario's herds were found to be shrinking, managers thought that the wolf population would shrink at about the same rate. But because the wolves were able to feed on other prey such as beaver, their numbers remained high for longer than expected and the ratio of wolves to deer increased.

Unlike wolves, coyotes and dogs do not normally rely on deer for food. Coyotes sometimes kill deer, usually fawns, particularly during severe winters; but they are better known as predators of smaller mammals like groundhogs, mice, rabbits and hares, and do not pose a widespread management problem. But dogs have become a significant cause of mortality, especially in the south. Most of the deer killers are domestic pets. They have no need to kill for food, yet they still harass deer in wintering areas. A few are wild dogs that may have been abandoned by irresponsible people. Supported on the crust, even a small dog like a terrier or a poodle can get the better of a deer foundering in deep snow. Some dogs attack in packs. Those deer that do not die of their wounds or that evade capture use up vital energy reserves, lessening their chances of surviving the winter.

Management: Predation by wolves must be controlled when an affected herd loses more members than it can replace each year. Wolf predation may be only one of several factors causing these losses; but when the overall causes are not fully understood and predation plays a significant role, it is necessary to remove some of the wolves to save the deer from serious decline. Controls are also desirable when a herd has a mortality rate equal to its reproductive rate and cannot reach carrying capacity.

Wolf predation is most serious in our more northerly areas. Because circumstances vary so much from place to place, the problem must usually be handled at the local level. If deer managers are to determine whether controls are needed within their areas, they need a rule against which to measure individual cases. Studies carried out within the last few years have led to the conclusion that, where the total causes of death are unknown, predator control should be begun when there is more than one wolf for every 140 deer within a given area at the onset of winter.

Predator control is also required when local managers decide that deer yards must be enlarged to meet the needs of herds and allow for growth. By removing some of the wolves that stalk the borders of the yards, managers can eventually get deer to enter new winter territory, where they can find fresh food supplies and shelter. Control activities may be continued while the new yards are becoming established.

It is better to concentrate intensively on removing small, problem-causing packs than to remove an equal number of wolves from over a broad area. This practice does not threaten Ontario's wolf population.

The methods used to remove wolves should be economical, humane, and specifically geared to the species so that other animals are not affected. Further research is needed to develop a method with all these advantages. Currently, sport hunting by those with wolf licences is encouraged, but the most effective and widely used control technique is trapping.

It is best to trap wolves in late summer and fall, and the job should be done by specialists in predator control. Many trappers' workshops now include sessions on wolves.

L. THURSTON

The Trapper Education Course sponsored by the Ministry and the Ontario Trappers Association also includes techniques for trapping wolves.

The problem of predation and harassment by dogs is most serious in the south, where deer have little tree cover in which to hide and dogs are common. Deer often winter in valleys and ravines, on old farm woodlots, or in other areas to which neighboring dogs can gain easy access.

Dog predation is not a natural condition but rather the result of human irresponsibility. Two approaches to the problem are used: the direct approach calls for the removal of troublesome pets and wild dogs from wintering areas, and the indirect approach calls for programs that encourage dog owners and municipalities to exercise their own controls. The two approaches can be combined effectively.

The direct approach includes removing pets and wild dogs from deer areas. It is illegal to allow pet dogs to run free in deer habitat during the closed season, and owners who do so can be fined. Conservation officers usually try to capture the dogs or have them followed to their homes and charges laid against their owners. In some cases, however, this is not possible, and the conservation officer may have no other choice than to shoot the offending animal. The law permits this.

One dog, three victims—the heavy costs of dog predation can be reduced if dog owners keep their pets at home.

The indirect approach includes setting up information programs that inform dog owners of their obligations and the consequences of failing to live up to them. Such programs may make use of advertising campaigns conducted before and during the critical winter season, and visits by conservation officers to the homes of dog owners. During such visits, the officers may advise the owners of their obligations. Such procedures encourage owners to act responsibly and may save the lives of their dogs. The Ministry also encourages local councils to enact their own by-laws to help minimize dog predation.

Poaching

The Problem and its Management: Poaching is the act of stealing game. The term *deer poacher* can be applied to anyone who kills deer without the appropriate licence, out of season, after dark, in a no-hunting area, or by any other illegal means. Poachers use many methods, including jacklighting—the most common one. Operating at night, jacklighters mesmerize the deer with a beam of light and shoot them as they stand disoriented. Poachers may act alone, taking one or two deer for their tables; or, they may belong to poaching rings that kill many deer and sell the meat for profit. The sale of deer meat is also illegal.

We don't know how many deer are lost each season to poaching, but we can be certain that in some parts of Ontario poaching is a significant limiting factor. Around Algonquin Park, poaching has been ranked fourth in importance, after hunting, predation and winter starvation. On Manitoulin Island, poaching has sometimes removed almost as many deer as are taken during the harvest. Throughout much of the southern agricultural zone, particularly where there is no open season for deer, poaching levels are so high that some deer managers rank poaching the number-one limiting factor.

Management cannot bring about herd increases or ensure a fair division of the harvestable surplus if poaching is uncontrolled. Yet achieving control is difficult, for the Ministry has only about 250 conservation officers to police the whole of Ontario. Although these officers try to anticipate poaching attempts, often remaining in the field all night to catch jacklighters, they cannot be everywhere at once. Sometimes, they are unable to prosecute known poachers for lack of clear evidence.

The old idea that poachers are harmless "Robin Hoods" who take a little game from greedy noblemen is now inappropriate. Yet that idea has helped to perpetuate an attitude of tolerance that can still lead people to turn a blind eye to poaching. The solution to this problem lies in recognizing that poachers steal from a publicly managed resource and infringe on the rights of others by reducing the number of deer available for hunting and other recreation. What is more, poachers jeopardize the future of the deer resource.

The law recognizes the seriousness of poaching by providing stiff penalties. Convicted poachers are liable to fines of up to $5,000 or jail terms of up to six months, or to both. People who knowingly accept or buy poached game participate in the crime and can be prosecuted.

To make the penalties effective tools for reducing poaching, the Ministry needs the cooperation of the public. Concerned hunters already recognize that there is only one fair and sportsmanlike way to harvest deer. They help to enforce the laws set up to protect their own interests and the deer resource. Often, it has been an alert hunter or recreationist who has spotted the signs of poaching and assisted conservation officers by providing evidence or testimony.

As more people come to recognize the harm that poaching does and help to control it by reporting violations, the impact of poaching as a limiting factor will be reduced. This is one way that people can show their concern for the welfare of our deer herds, and ensure that they will be here for many years to come.

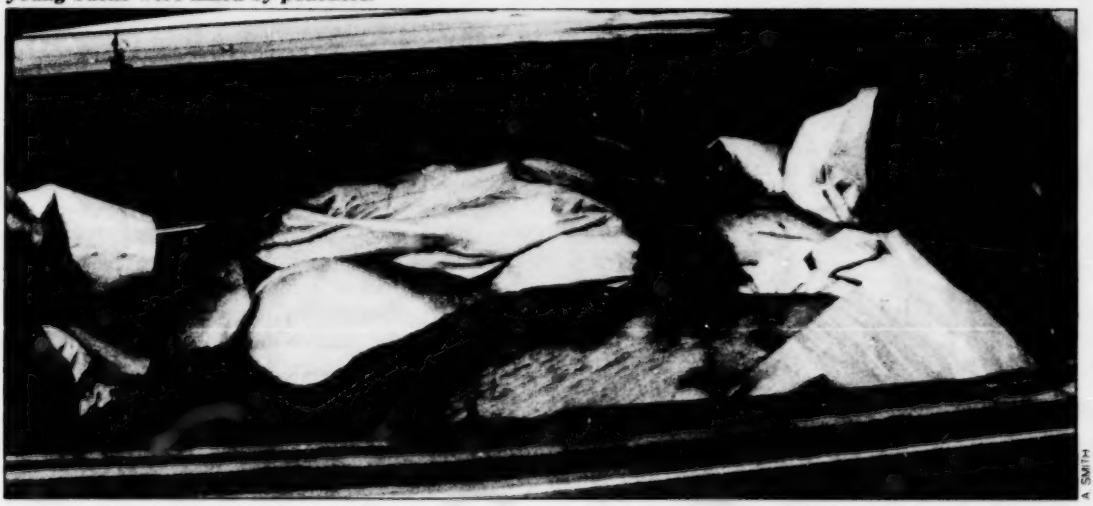
Climate and Winter Starvation

The Problems: While white-tailed deer were becoming established in Ontario, a favorable climatic change was taking place. After the turn of the century, winters became milder than during the late 1800s. The incidence of extreme cold, deep snow and winter starvation—all major limiting factors for deer—was reduced.

Severe cold has a serious impact on deer because it drains them of energy and puts them at risk of dying from exposure. When low temperatures are accompanied by deep snow, survival and reproductive rates can fall dramatically. Soft, deep snow provides bedded deer with insulating warmth, but this benefit is outweighed by the adverse effects. It does not matter how plentiful the supplies of food and shelter are. If cold and deep snow persist for an extended period—and particularly if the snow accumulates to more than 60 centimetres without forming a thick, supporting crust—deer die. They can neither escape predators nor reach their food supplies to replace the energy they expend in keeping warm.

Many people have been puzzled on finding deer dead of starvation within what looks like easy reach of untouched browse. Why deer refuse to leave their well-packed trails for nearby browse is not fully understood. Some managers believe that the energy required to wade through snow and eat and digest new food exceeds the energy which that food might supply. Another theory holds that the deer are afraid of being overtaken by wolves or

Their velvet-covered antlers only half formed, these young bucks were killed by poachers.



A. SMITH

Deep, unencrusted snow (right) is a major winter killer. Even when a deer survives until spring, it may be so malnourished (above) that it dies before summer.

dogs as they leave their trails for deep snow. Even when deer managers have reduced this threat by removing some of the local predators, deer have remained in their traditional yards. It takes a long time to coax them into new territory.

Deer compete intensely for the accessible food. Fawns, the weak and the old are the first to suffer. By rearing up on their hind legs, deer strip the trees, creating high browse lines such as can be seen on Manitoulin Island and the Bruce Peninsula each winter. Occasionally, deer prune the vegetation so severely that much of it dies, but this is not common in Ontario.

Malnutrition begins when the fat on the deer's rump and in the body cavity is used up. The hide roughens and hangs loosely, the hip bones protrude, and the flanks become hollow. At later stages, the jaw looks swollen, the back humped, and the eyes dull. The last energy storehouse is the bone marrow. In a healthy deer, this is pale yellow and full of fat. In a starving deer, it is red, jelly-like and watery. When managers find dead deer whose bone marrow is empty of fat, they know that malnutrition is afflicting the local herd.

Drained of all reserves and unable to get to food, deer become easy prey. Those that survive predation, starvation and exposure may suffer long-term effects. This is especially true of fawns. If their first winter is marked by malnutrition, they may never grow to full size. Pregnant, starving does may reabsorb their embryos to meet their own needs, or their unborn fawns may die in the womb, mummify, and sterilize them. The development of the unborn fawns may be temporarily halted, causing late birth. If the fawns live to be born, they may die shortly after of their own weakness or a failure of the does' milk supplies.

The loss of unborn fawns and the deaths of the newborn can have an impact on herd size long after the winter responsible. It takes

as little as two or three months of persistent deep snow to cause drastic declines. Where continuous logging keeps the habitat in good condition, as is still the case in much of the northwestern zone, herds often make fairly rapid recoveries. But increasingly few herds live in ideal habitat, and severe winters have been increasingly common.

The warming trend that furthered the northward progress of Ontario's deer lasted until roughly the mid-1950s, or just about the time the forest habitat began to decline. Since then, there have been several groups of severe winters. These have been interspersed with milder winters that allowed the herds to achieve limited recovery, but the general trend has been one of cold weather and deep snow. By itself, this might not have had a widespread effect on the deer population. But together with deteriorating habitat and other limiting factors like hunting and predation, it has often caused very serious losses.

The herds yarding south of the French and Mattawa Rivers lost an estimated 50,000 members during the winter of 1958-59. Another bout of severe weather the next year killed half of the Bonnechere herd east of Algonquin Park. The magnitude of this can be appreciated when the loss is compared to the mere nine per cent Bonnechere lost during the next, and much milder, winter. Severe weather in 1965-66 killed from one-third to one-half of the deer in the northwestern zone, only 10 years after an equally bad winter had reduced those herds by at least half.

Management: In recent years, winter habitat management has been used to lower winter mortality rates significantly in some parts of Ontario, despite severe weather. During the harsh winter of 1977-78, for example, the mortality rate of the Loring herd was kept at 20 per cent; prior to the use of management techniques, this herd lost an estimated 50 per cent during bad winters such as that of 1958-59.

Providing deer with the necessities for winter survival demands careful planning and preparation and is difficult and costly. Success depends greatly on the co-operation of the public. Landowners can help the Ministry by allowing access to areas used by wintering deer so that management work can be done. They can also manage their conifers and other trees in ways beneficial to deer, using the techniques described in the habitat section of this booklet.

The basic concept of winter habitat management is simple. Deer must have browse near their shelter trees, and must be able to move between their feeding and shelter areas. The Ministry identifies those yards in which management would bring the greatest benefits, reserving smaller ones for future work to be done when time and money permit. Two main management activities take place in the yards selected: browse cutting, and trail breaking.

Browse cutting serves two purposes. First, it provides food to relieve existing winter stress. Among the plants cut to provide immediate browse are red, striped, sugar and mountain maples, hazel, dogwood, hobblebush and various other viburnums, poor quality white birch and poplar, and any unmarketable hemlocks and cedars that do not form part of a sheltering canopy. In some areas, aspen, willow and ash can be used. The second purpose of browse cutting is to stimulate the growth of food plants for future winters. When small plots of unmarketable deciduous trees and shrubs are cut off at the ground or snow level, regeneration from underground root systems usually supplies new stems in later years.

In the northwestern zone, it is difficult to supply winter browse because the deer are not confined to designated areas. Logging operators are therefore encouraged to leave stands of mature timber for cover near the cut-overs where deer find winter browse.

Once the areas in which browse cutting is to occur have been chosen, trail breaking can be planned. The work begins with the mapping out of a system of trails for each yard. In established yards, the system should follow the deer's traditional trails as much as possible. Additional trails can be planned to provide access to new feeding sites. Each system should have plenty of branches and intersections so that, when viewed from the air, it has the criss-crossed look of a spider's web. There should be a minimum of trails leading to houses or farms so that dogs cannot gain easy access. Once mapped, the trail system can be marked out at each site by blazing the trees. When winter has begun, workers can follow the markers and tamp down the trails with snowshoes or snowmobiles. If trails are not broken until after the snow becomes more than about 60 centimetres deep, heavier machinery like bulldozers may be needed.

In most cases, these techniques of winter habitat management will fully meet the needs of deer. But if trees and shrubs suitable for browse cutting are not available, managers may decide to provide supplementary food such as grain. Supplementary feeding can also

be desirable where browse has not yet regenerated sufficiently to tide deer over the winter, or where pressure on a core yarding area must be reduced by enticing some deer to remain on the outskirts. Where deer winter on private land and browse cutting is impossible, supplementary feeding may also be used. It is difficult to determine where or for how long supplementary feeding should be carried out, so it should be practised only by experts from the Ministry or on their advice. If done incorrectly, supplementary feeding leads to a host of problems. For example, if begun only after the deer have been weakened by the loss of too much weight, it may not save them. It is important that supplementary feeding be done only where essential to prevent serious decline, and that it go hand in hand with natural browse production wherever possible.

Browse cutting provides both immediate and future food supplies. Trail breaking, done here with a drag, lets deer move freely between food and shelter.

Supplementary Feeding

E. BAIN

P. MONK

L. WHISTANCE-SMITH

E. BAIN

Minor Limiting Factors

Parasites, Diseases and Accidents: Ontario's deer do not experience epidemics or plagues of parasites that wipe out whole herds. Parasites and diseases kill them on a limited basis, but deer usually die of such causes only when weakened by another factor such as malnutrition. Whitetails share some of the parasites and diseases common in domestic animals like cattle. It is possible that deer come into contact with the larvae, bacteria or other organisms as they graze in areas where affected livestock have recently been feeding.

Our deer can play host to at least three types of intestinal tapeworms. Other internal parasites include liver flukes, lung worms and brain worms. Brain worms seldom harm deer, their normal hosts, but when passed on to other deer-family members can badly damage brain and spinal cord tissues. Since deer extended their range northward and came into contact with moose, brain worms have affected our moose population. The resulting disease, commonly called *moose sickness*, ends in death.

External deer parasites include the larval bot-fly that lives in the nose or throat, as well as the tick and a type of wingless fly called the *ked*, both of which live on the hide. As well as causing discomfort, ticks and keds carry disease from one deer to another. When a herd is suffering from overcrowding and malnutrition, parasites tend to become more numerous and can be a contributing cause of death.

Among the contagious diseases deer can get are Bang's disease or brucellosis, which causes abortion; fibromatosis, which causes numerous tumors called *fibromas* on the white tissue that connects most internal body tissues; and leptospirosis, a blood disease caused by hook-shaped bacteria. Malnourished deer may succumb to lung diseases like pneumonia.

Because parasites and diseases are natural conditions in the wild and are not a major limiting factor, deer managers do not normally try to control them. They can actually result in a hardier herd, since the weakest animals die and the survivors pass their resistance on to new generations. However, managers do monitor any situations in which there is the possibility that the deer might infect livestock.

A variety of accidents kill deer. They may drown after breaking through thin ice; they may fail to clear fences and become hung up in the wires; they may catch their heads, antlers or legs in forked trees as they rear up to feed; or they may stab themselves on sharp branches as they bound through the brush.

But by far the most common type of accident is collision with road vehicles and, occasionally, with trains. Road accidents caused by deer are common in southern Ontario. In the vicinities of communities like Cambridge, Oakville, Guelph and Hamilton, there were 367 such road accidents during 1979, 350 during 1980, and 330 during 1981. These accidents pose a threat to human life and property as well as to deer. Often, they

B. LAFRANCE

can be prevented. Motorists should always observe deer-crossing signs along roadways by slowing down, particularly after dark when deer may be most active. Because groups of deer sometimes cross roadways in single file, a driver can be distracted by the first deer seen and hit one of the followers. Upon seeing a deer along a road, it is best to pull over to the side until it has gone. The horn should not be sounded because it could cause the deer to turn back, and headlights should be off so that the deer does not "freeze." Parking lights should be left on for safety.

Like parasites and diseases, most kinds of fatal accidents are not preventable, require no management procedures, and do not significantly affect the population. Only deer-vehicle collisions require preventive measures that will protect people and property. Because these accidents usually occur where deer populations are high, and increase as the local herds increase, they can be minimized by reducing the deer surplus. Deer managers hope to achieve this through the controlled hunts now occurring in the agricultural south. A second way to reduce these accidents is to ensure that any new roads and highways are built around rather than through deer areas such as yards. Deer managers can promote this by participating in the planning of new travelways.

These massive tumors show one of the worst cases of fibromatosis ever seen in Ontario. Deer-vehicle collisions (top) are common in southern Ontario.

Gathering the Facts

The management techniques described in this booklet should greatly benefit Ontario's deer. But for managers to know which techniques to use and when, they must have biological information about each herd. This has always been important, but it has never been more vital than in the few years since the current harvest system was devised. Selective harvest requires more information than the any-deer system it replaced.

Taking an inventory of a deer population is never easy. It is especially difficult in forest habitat. Though it is impossible to count every deer, several methods can be used to estimate herd size.

PHOTOS BY R. GRAY

Important information needed to manage each deer herd is gathered at roadside check stations during the annual harvest. At left, an attendant removes a buck's lower jaw for aging.

The methods of inventory most often used are indirect in approach and do not rely on actual head counts. From a survey of a small, representative sample, biologists draw conclusions about an entire herd. Winter-mortality data, road-kill data, counts of deer tracks along roadsides, and studies of trails in wintering areas or yards are sometimes used. But the most common type of inventory is the pellet-group survey, which estimates herd size through a count of the pellet groups (deer droppings) found in a wintering yard after the snow has melted. A computer program called *ONEPOP* allows biologists to construct a computer model of a herd they have sampled. From this information, which can be stored for future use, it is possible to predict how various limiting factors might affect a herd over both the short term and the long term.

Direct methods of inventory are very difficult and often unreliable. The aerial survey—a count of deer or deer tracks in snow seen from a plane or helicopter—is the most common direct method. It works only over fairly open countryside such as is found in southern Ontario. Another direct inventory method, the drive count, requires two groups of people; the first drives the deer toward the second, which waits in cover and counts the deer as they run past. Drive counts are useful only within a contained area like a small peninsula, where the deer must run in one direction rather than scattering widely.

Deer managers need more than an estimate of numbers to work effectively. They must also understand the causes and levels of mortality, and must assess a herd's productivity and its physical well-being. This information lets managers identify limiting factors, gauge the affected herd's ability to recover from losses, and relate population size to climate, mortality, carrying capacity and other considerations. A herd's physical well-being is reflected in the antler size of the bucks, the percentage of fawns and yearling does that become pregnant, and the size of the newborn or unborn fawns. Some of these things can be measured during the harvest, and others are noted during examinations of road-killed or winter-killed deer. If a doe were killed on the highway, for example, conservation officers would record her sex and age and the size and number of any unborn fawns. In summer and fall, they would also check to see whether her milk glands were active—an indication that she had recently reproduced.

To plan the selective harvest each year, deer managers must know approximately how many fawns and does can be taken from each herd. Information about the age and sex structures of a herd usually comes from har-

A check-station attendant weighs a prize buck, measures its antler beam and records the number of points on its rack.

G. NELSON

vest data. Some data are gathered at check stations near hunting sites, and others come from questionnaires that hunters complete and return to the Ministry. Because the age of deer can be determined by examining their molars and incisors, the Ministry also urges all hunters to turn in the jawbones of their deer in return for hunting crests.

Information about winter severity is another essential management tool. Throughout the winter season, readings of indicators like snow depth, crust conditions and wind chill are taken at snow stations in deer yards and at other sites across the province. Such data let deer managers estimate the impact on local herds of snow, cold, predation, and other limiting factors associated with winter. They also indicate whether emergency yard work or other special measures may be needed.

Other kinds of information are also sometimes collected to supplement our knowledge of deer. For example, radio telemetry can be used to track their movements. By outfitting deer with signal-emitting collars that can be tracked by directional receivers, biologists can learn more about the deer's daily activity patterns, the distance they range in a given time, when they enter and leave their wintering areas, and even how they interact.

A doe gets to her feet after being tranquilized and fitted with a radio collar and identification tag.

P. C. SMITH

Looking Forward

Wildlife management is a comparatively young scientific discipline, and this is especially true of deer management in Ontario. Unlike some parts of the United States, where whitetails fared so poorly that stringent hunting controls were needed at the beginning of this century, Ontario offered most of its herds a prosperous life until mid-century and beyond. Though local declines did occur, most notably in the south during the late 1800s, the effects were somewhat offset by population increases going on elsewhere. Until about the middle of this century, there seemed little chance that the provincial herd might become so depleted as to threaten an inability to meet demand. This relative abundance provided scant motivation to study deer, or to practise scientific management.

As the conditions that had favored deer gradually altered, the provincial deer population began to decline. It took time for the decline to make itself apparent, for its causes to be isolated and understood, and for remedies to be found.

Yet in the comparatively brief period since the need to manage deer more carefully became obvious, much has been learned. Many of the problems that until recently seemed beyond the scope of management—a matter of letting nature take its course—are now being tackled. Today, Ontario's deer managers understand better what it is deer need from their habitat, and some of the ways those needs can be met; they can offset some of the effects of harsh winter weather and deep snow; they have instituted a promising harvest system to relieve hunting pressure where it is excessive and increase it where it is slight; they know when and how to alleviate the stress of predation by wolves and dogs; and they have the penalties in place to discourage poaching.

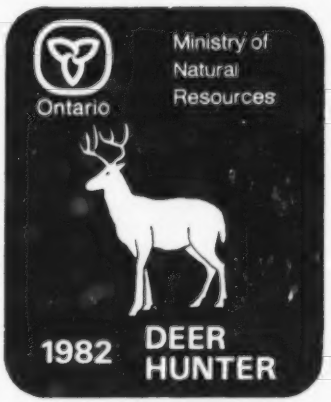
There is still a good deal to be learned about Ontario's whitetails and their management. And, as circumstances affecting deer continue to change, management will have to keep pace. But so long as the deer resource of Ontario continues to be valued, its presence will be assured.

DEER & MOOSE HUNTERS

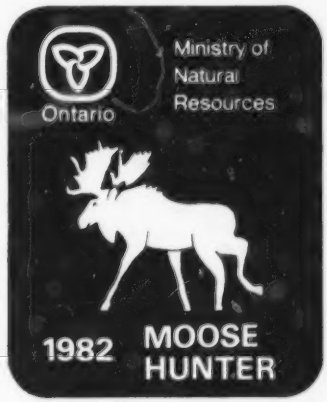
HELP THE MINISTRY COLLECT INFORMATION

Turn in the lower jaw of your deer or moose at any District Office of the Ministry of Natural Resources or a game checking station, preferably as close as possible to where you hunted. Kindly bring your deer or moose licence number with you when turning in jaws. This will facilitate the recording of harvest information. Jaws must be received on or before

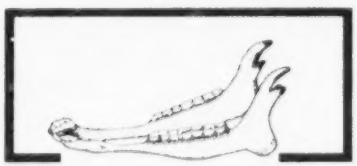
December 31, 1982



You will receive this crest in exchange for the entire lower jaw of your deer

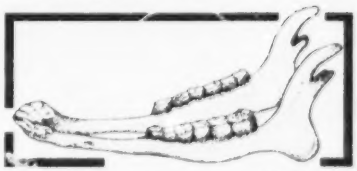


You will receive this crest in exchange for the entire lower jaw of your moose



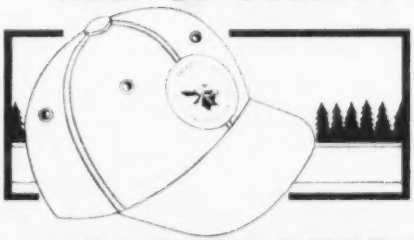
Deer Jaw

We get valuable information about the age of the animals. You get an attractive crest and a better managed resource.



Moose Jaw

HELP US COLLECT HIDES FOR NATIVE PEOPLE



You will receive this blaze orange hunting cap in exchange for a suitably prepared deer or moose hide (a pamphlet "**Preparation of Moose and Deer Hides**" is available at Ministry offices)

Hides may be left at most Ministry of Natural Resources offices or at designated collection centres

We get hides for distribution to native people. You get a hunting cap and an opportunity to provide material for native crafts.

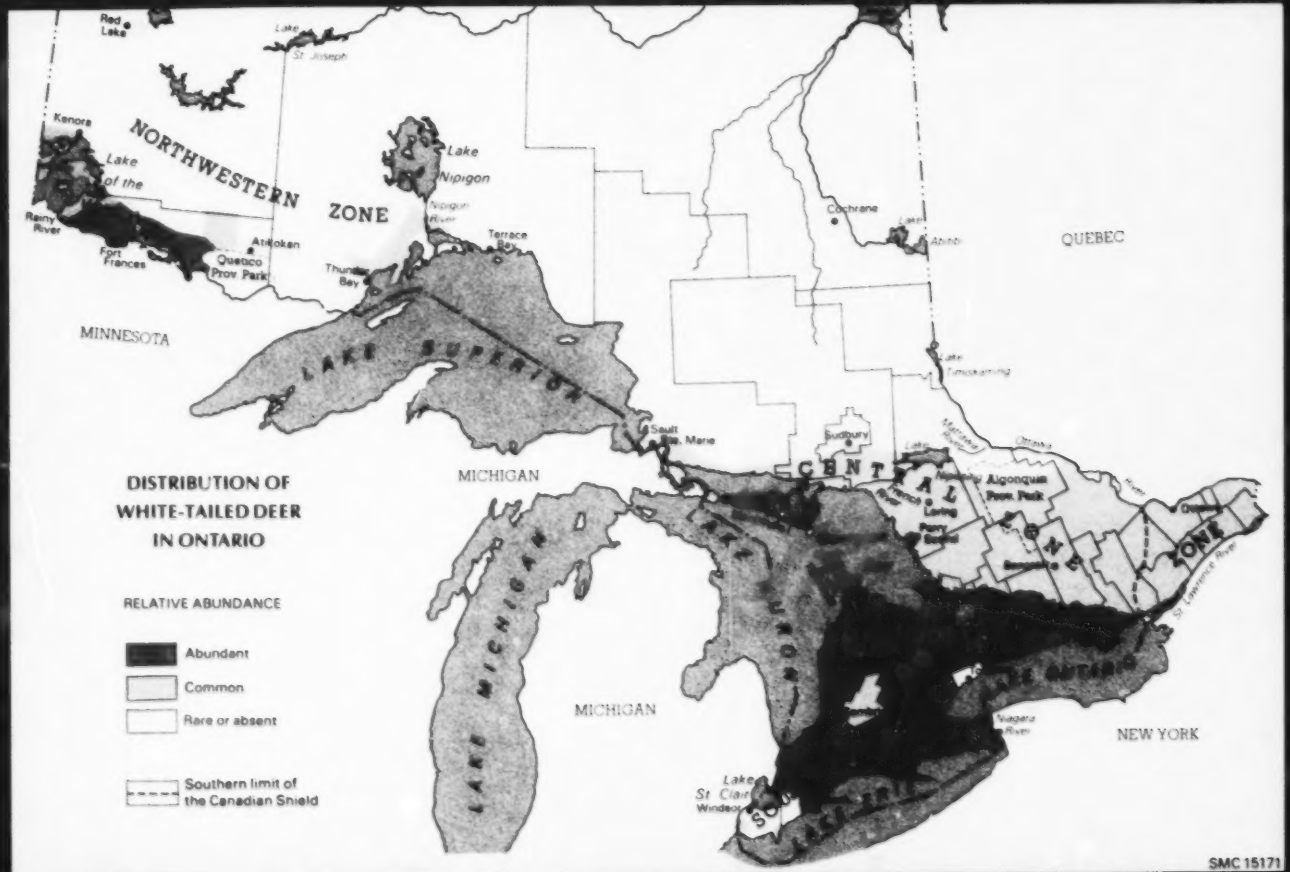
YOUR COOPERATION IS APPRECIATED!

Ontario

Ministry of Natural Resources

Hon. Alan W. Pope
Minister

W.T. Foster
Deputy Minister


DISTRIBUTION OF
WHITE-TAILED DEER
IN ONTARIO
RELATIVE ABUNDANCE
Abundant
Common
Rare or absent
Southern limit of
the Canadian Shield
NORTHWESTERN ZONE
CENTRAL ZONE
SOUTHERN ONTARIO ZONE
QUEBEC
MINNESOTA
MICHIGAN
MICHIGAN
NEW YORK
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
Red Lake
Lake St. Joseph
Kenora
Lake of the Woods
Rainy River
Fort Frances
Atikokan
Quetico Prov. Park
Thunder Bay
Lake Nipigon
Nipigon River
Terrace Bay
Cochrane
Lake Abitibi
Lake Timiskaming
Sault Ste. Marie
Sudbury
Algonquin Prov. Park
Lake Nipissing
French River
Parry Sound
Muskoka
Ottawa River
St. Lawrence River
Niagara River
Lake St. Clair
Windsor
SMC 15171

POOR

QUALITY

ORIGINAL